Barriers to and opportunities for effective cumulative impact assessment within state-level environmental review frameworks in the United States

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Barriers to and opportunities for effective cumulative impact assessment within state-level environmental review frameworks in the United States

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In the US, relatively little research has been done in recent years to inform the development and implementation of cumulative impact assessment (CIA) policy. Past studies have primarily focused on the requirements and practices of the National Environmental Policy Act, but little is known about the challenges and opportunities relating to CIA practices at the state level. By analysing data from a national survey of state environmental review programme administrators, this study identified the inability of state programmes to facilitate CIA practices as a major barrier to effective implementation, particularly reflected by the perceived lack of explicit procedures and data for conducting CIA. Important strategies for improvement included adopting detailed guidelines specifying what to include in an assessment and developing institutional mechanisms to encourage state agency co-ordination. Some differences in perception were observed across programmes due to the different types of state-level environmental review frameworks within which cumulative impacts are assessed. In addition, administrators from programmes without CIA requirements seemed to overestimate the cost and time needed to implement CIA. Changing their perception may contribute to the adoption of CIA procedures in these states.

Keywords: cumulative effects; environmental impact assessment; environmental policy

1. Introduction

Cumulative environmental impacts are the incremental effects of a single action in the context of other related past, present and foreseeable future actions regardless of who undertakes them (Council on Environmental Quality 1997). Such impacts are different from direct and indirect environmental impacts, where direct impacts are caused by a project and occur at the same time and place as the project, and indirect impacts are not immediately related to a project but result from the project and can occur later in time or farther removed in distance (CEQ Regulations for Implementing NEPA 1978, State CEQA Guidelines 2007). Comparatively, cumulative impacts (CIs) can be additive or synergistic, resulting from direct or indirect effects of multiple activities at different locations or sequential activities on the same site (MacDonald 2000).
Cumulative impact assessment (CIA), also referred to as cumulative effects assessment (CEA), is the process of systematically identifying and analysing additive or interactive environmental effects resulting from the recurrence of actions over time in order to avoid cumulative environmental change in a given geographic area (Smit and Spaling 1995, Harriman and Noble 2008, Hanna 2005). CIA is considered an essential tool to facilitate sound environmental planning and management (Council on Environmental Quality 1997), particularly when development activities have individually minor but collectively significant impact on the environment. In many countries, CIA is undertaken in parallel with or as part of the environmental impact assessment (EIA) process (Wärnbäck and Hilding-Rydevik 2009). The Canadian Environmental Assessment Act of 1995 requires the assessment of any CIs likely to result from a project in combination with other projects that have been or will be carried out, although relevant requirements of provincially mandated EIAs vary from province to province (Duinker and Greig 2006). CIA is required under two European Commission Directives on EIA (85/33/EEC and 97/11/EC), and is implemented in the UK under the Town and Country Planning (EIA) Regulations of 1999 (Piper 2001, Masden et al. 2010).

In the US, CIA is an important component of the federal environmental review process (equivalent of EIA). The National Environmental Policy Act (NEPA) of 1969 provides a framework for federal agencies to assess environmental impacts of proposed federal actions prior to their undertaking. It is important to note that NEPA only applies to proposed federal actions, including new and continuing projects and programmes entirely or partly financed, assisted, conducted, regulated or approved by federal agencies; new or revised agency rules, regulations, plans, policies or procedures; and legislative proposals (CEQ Regulations for Implementing NEPA 1978). In addition, and unrelated to the federal requirements, is an array of state legislation adopted for evaluating activities proposed, permitted or funded by state or local units of government. The extent to which CIA is integrated into federal- or state-level environmental review processes can significantly influence the adequacy of the review and its ability to fully characterise the nature and extent of anticipated environmental impacts. If only project-specific impacts are assessed when an environmental review is conducted, potentially significant CIs may be overlooked, even if such impacts determine the need for conducting further studies or whether relevant permits or funds should be granted (Canter and Canty 1993, Burris and Canter 1997a, Hegmann et al. 1999, DiMento and Ingram 2005). Failure to integrate CIA into an environmental review process can compromise the utility, credibility and purpose of the process (Rees 1995).

Despite its importance, insufficient description of CIs in EIA documents has been reported from several countries. For example, CIs are rarely described or included in Swedish EIAs (Wärnbäck and Hilding-Rydevik 2009). Cooper and Sheate (2002) reviewed 50 UK EIAs and found that 48% mentioned the term ‘cumulative effect/impact’ while only 18% provided a discussion of the issue. Therivel and Ross (2007) conducted an analysis of Canadian and UK CEAs and concluded that while there were examples of CEAs leading to effective management of cumulative effects, this had not occurred as often as it should. In addition, Baxter et al. (2001) conducted a critical evaluation of 12 Canadian EIAs and concluded that the assessment of CIs in these documents was inadequate due to insufficient scoping and analysis, and the overall quality of CEA in Canada was unsatisfactory. In many developing countries, EIA is required under the auspices of the World Bank, as described in Operational
Policy 4.01 and Bank Procedures (BP) 4.01 (World Bank n.d.). Although BP 4.01 requires the Bank and borrower staff to consider the potential for significant cumulative impacts from multiple subprojects, few EIAs addressed cumulative impacts in any detail (World Bank 1997, Glasson et al. 2005). As a result, some high-profile development projects have been subject to scrutiny with respect to cumulative impacts, including the Nam Theun 2 (NT2) Hydropower Project, the largest infrastructure development project in Laos. A cumulative impact analysis was specially requested by the World Bank and other international donor institutions to analyse the potential impacts the project may have on the development of the area and the cumulative impacts of a number of projects, either implemented together or in a sequence and of future developments and plans, in relation to NT2 (Asian Development Bank 2004).

2. Assessing cumulative impacts in the US

In the US, considerable effort has been made to help NEPA practitioners and environmental planners identify and describe CIs when preparing environmental review documents as part of the NEPA process. Examples include, but are not limited to, a 1997 handbook titled Considering Cumulative Effects under the National Environmental Policy Act by the Council on Environmental Quality, a 1999 handbook titled Consideration of Cumulative Impacts in EPA Review of NEPA Documents by the Environmental Protection Agency, and various state-issued manuals, such as Guidance for Conducting a Cumulative Effects Analysis by the Wisconsin Department of Transportation in 2007. Despite the guidance provided, a number of researchers have documented that CIs were often ignored or given very little attention in NEPA’s implementation; CIA was among the most difficult tasks environmental planners face when preparing NEPA documents; and court cases challenging CIA became increasingly common (Herson and Bogdan 1991, McCold 1991, Canter and Kamath 1995, McCold and Holman 1995, Burris and Canter 1997a, 1997b, Cooper and Canter 1997a, Rumrill and Canter 1997, Eccleston 1999, Bass et al. 2001, DiMento and Ingram 2005, Smith 2006). As recently as 2002, the US Congress responded to complaints about inadequate CIA by federal agencies of oil and natural gas exploration on Alaska’s North Slope and directed the National Academy of Science (2003) to convene a committee to assess probable CIs of relevant activities in the region. This evidence further suggests that evaluation of CIs is generally missing from NEPA documents and inadequate CIA remains a major shortcoming of the federal environmental review process in the US (Bronstein et al. 2005, Smith 2006).

The existing literature provides valuable insights into the reasons for insufficient CIA within the NEPA framework. The policy implementation analysis framework developed by Sabatier and Mazmanian (1981) is used to facilitate the understanding and organisation of existing literature. This framework is grounded in policy theory and has been widely applied to analysing a variety of environmental policies (Lester and Bowman 1989, Albert et al. 2003, Bayrakal 2006, Zhang et al. 2011). According to this framework, various factors affecting policy implementation can be grouped into three broad categories: (1) the tractability of the issue being addressed; (2) the ability of a policy to favourably structure its implementation; and (3) the balance of support for the issue being addressed. In the case of CIA within NEPA, the tractability of the issue refers to how explicitly CIA is required by NEPA and related
regulations. If relevant requirements and terms are ambiguously defined, project proponents and responsible agencies will feel little obligation to assess CIs. The second category refers to the ability of NEPA and related regulations to guide and facilitate CIA practices, specifically reflected by whether explicit CIA procedures, practical guidance on assessment methods, adequate institutional support and a reasonable timeframe for conducting an assessment are provided. Finally, the balance of support for the CIA issue depends on the attitudes of constituency groups (e.g. project proponents, businesses and industries) towards CIA, the attitudes and commitment of implementing officials, and the awareness and attitudes of the affected public.

Using this framework to examine CIA literature at the federal level, the tractability of the CIA issue seems lacking in NEPA and related regulations, specifically manifested as ambiguous definition of temporal scales, geographic scales and baseline conditions for assessing CIs (MacDonald 2000). There exists a general agreement that relevant past and future actions contribute to CIs, but it is uncertain as to how far into the past and future to consider those actions (McCold and Saulsbury 1996). As a result, the temporal scales used for assessing CIs in many NEPA documents are often too short (Smith 2006). Similarly, small geographic scales allow detailed assessments but can potentially sacrifice an understanding of the broad CIA context; conversely, large scales are more appropriate for CIA but may lead to superficial assessments given limited data availability (Canadian Environmental Assessment Agency 1994). When geographical scales expand, CIs become more complex; solutions to problems affect multiple agencies, and information sharing becomes essential (Council on Environmental Quality 2003). As a result, the geographic area chosen for a CIA is often too small (Smith 2006). In addition, when determining an appropriate baseline for a CIA, common practice is to consider the existing environmental condition against which to evaluate project-specific impacts. However, this may not be appropriate because it makes the effects of past actions part of the baseline rather than a contributor to CIs (McCold and Saulsbury 1996). For example, assessing cumulative watershed effects has long been problematic because of the difficulty posed by evaluating background and baseline conditions in the watershed of interest (MacDonald et al. 2004).

The inability of NEPA and related regulations to favourably structure CIA implementation also contributes to insufficient practices at the federal level. One of the major challenges facing NEPA practitioners is the absence of specific requirements and uncertainty as to which factors to address in a CIA process, and further guidance and training in the analysis of CIs has been identified as one of the most important needs among NEPA practitioners (Burris and Canter 1997a, Cooper and Canter 1997a, MacDonald 2000, Smythe and Isber 2003). Another common challenge is the lack of data and/or a convincing rationale for selection of data for assessing CIs (Smith 2006). A comprehensive CIA relies on the availability of data (Masden et al. 2010). NEPA reviews often relate to a specific proposal. A project proponent often has limited information regarding other projects and their effects, and has little or no control over these activities (Therivel et al. 1992, Dube´ 2003). In a competitive business such as energy supply, acquiring information from other developers about potential actions sufficient to conduct a thorough CIA is difficult, if not impossible (Masden et al. 2010). Thus, a need exists for establishing institutional structure to encourage the sharing of information among private project proponents, particularly when business competitors are involved. Related to this lack of
information sharing among private parties is the limited co-ordination among federal agencies (Clark 1994, Burris and Canter 1997b). It is not easy to conduct a CIA comprehensively and perfectly (Thatcher 1990) for many reasons, including: (1) the lack of time and resources to effectively analyse the often large spatial and temporal scales needed to assess CIs; and (2) the lack of sufficient data or methods to analyse some of the impact questions that will arise in a CIA – such as the lack of quality baseline information for a given project area (Smith 2006). Co-ordination can facilitate the sharing of resources and data, and without co-ordination an agency alone may not be able to adequately assess CIs, particularly in a time of shrinking budgets and increasing workload at the federal level (Joaõ 2002). Finally, the existing methods used for assessing CIs may not be effective (Cooper and Canter 1997b). One of the most commonly used methods is a checklist, a list of project-specific environmental indicators with little or no emphasis on assessing CIs over time and across landscapes (Cocklin et al. 1992). When a NEPA document is challenged in court on the basis of insufficient CIA, the US judicial system should not only focus on whether the responsible federal agency has met relevant requirements but also examine the technical validity of the assessment, which may incentivise the use of appropriate CIA methods (Thatcher 1990, MacDonald 2000).

Finally, the lack of support, particularly from stakeholder groups and the affected public, could also contribute to insufficient CIA. Because CIs are incremental, making them difficult to discern, public awareness of such impacts is often minimal until a critical point or threshold is exceeded (Tollefson and Wipond 1998). In practice, the lack of public awareness may lessen the threat of public embarrassment and court challenges, which, in turn, reduces the pressure on federal agencies to comply with NEPA and associated CIA requirements (Andrews 1990). A recent study suggested an increasing trend of stakeholder groups taking federal agencies to court on the basis of inadequate CIA (Smith 2006). Whether or not this trend will facilitate effective CIA implementation within the context of NEPA deserves further examination.

In contrast to the well-documented challenges of conducting an effective CIA as part of the NEPA process, little is known about CIA barriers at the state level. In the US, many economic development projects occur as a result of non-federal actions and are beyond the scope of NEPA. The environmental impacts of these projects, including CIs, are subject to assessment following state-level environmental review procedures. Therefore, there is a great need to understand how knowledge gained from previous federal investigations reveals strategies for effectively incorporating CIA into these state procedures. So far 37 states have been identified as having state-level environmental review policies and can be categorised into two tiers (Ma et al. 2009a; Figure 1). Tier-one includes 16 states that have adopted statewide comprehensive protocols for proposed projects across all sectors. These policies mimic NEPA in scope and intensity (Sullivan 2004), and require the preparation of environmental review documents following its model. Tier-two includes 21 states where environmental review is required only for certain activities (e.g. power plant construction, housing development), in certain natural resource sectors (e.g. forestry, mining), or in the proximity of certain ecologically-sensitive geographic features (e.g. lakeshores, a coastal zone). Unlike tier-one states, tier-two states generally require environmental review as part of a permitting or government funding process. For example, in Michigan a special-use permit is mandatory for housing, commercial and industrial development projects located in critical sand dune areas. To obtain such a
permit, the project proponent is required to undertake an environmental evaluation of the project.

In these 37 states, 48 active environmental review programmes have been identified across a variety of agencies, with some states having only one programme and others having multiple programmes, each responsible for specific types of development activities. Among these 48 programmes, 19 do not have any CIA requirements and 29 contain explicit provisions for incorporating CIA into their review procedures. Yet, the extent to which CIs are evaluated varies greatly. For example, some programmes require an assessment to focus on specific natural resource issues, while others require comprehensive examination of CIs on the environment as a whole; some require CIA without detailed procedural guidance on how the analysis should be carried out, while others have adopted specific scales, baselines and criteria to measure CIs; and, intergovernmental co-ordination is given little attention in some programmes whereas others have established extensive procedures to facilitate co-ordination among federal, state and local agencies (Ma et al. 2009b).

Given the great variation of CIA requirements among state environmental review programmes, it is particularly important to understand the practical challenges and opportunities confronting different state programmes in effectively carrying out
relevant analyses. Previous studies on CIA within NEPA shed light on CIA implementation at the state level. Building upon this literature, this paper identifies and describes important barriers to state-level CIA and explores the potential for improving CIA within the context of state environmental review in the US.

3. A survey of state environmental review programme administrators in the US

The data used in this study were drawn from a national mail survey of state environmental review programme administrators approved by the Institutional Review Board at the University of Minnesota. These administrators had a variety of titles, including agency/division/bureau director, programme supervisor/manager, environmental projects co-ordinator, impact assessment manager, environmental supervisor, and environmental/natural resource analyst/planner. All of them were from state environmental or natural resource agencies responsible for overseeing and implementing state environmental review policies, and had extensive knowledge of their respective programmes.

The survey was conducted in late 2007. Questionnaires were sent to the administrators of 48 active environmental review programmes across the 37 states having adopted state-level environmental review frameworks. The survey was administered following Dillman (2009). An email was sent to all participants to introduce the study. The questionnaire along with a cover letter was either emailed or mailed a few days later, followed by an email reminder. A second questionnaire was sent to those who failed to respond. Additional effort was made to contact administrators who still failed to respond, and weekly correspondence was made with non-respondents via email or phone until they completed the questionnaire or declined to participate. Thirty-eight complete questionnaires were returned and the response rate was 79%. Twenty-nine complete questionnaires were from programmes with CIA requirements and nine from programmes without any formal CIA policy. Responses from the 29 programmes were used to identify important barriers to and opportunities for undertaking effective CIA. Responses from the nine programmes were used to explore factors contributing to the lack of incorporating CIA into existing state environmental review procedures.

Survey design was informed by the aforementioned CIA literature within the context of NEPA. All questions were pre-tested with the help of several environmental planners in Minnesota. Administrators from programmes with CIA requirements were asked to identify barriers to and opportunities for effective implementation. Sixteen potential barriers and nine potential opportunities were given to each administrator, divided into three broad categories according to the policy implementation analysis framework discussed earlier. Each potential barrier was rated on a scale of 1 to 4 (1 being ‘not a barrier at all’, 2 being ‘minimal barrier’, 3 being ‘moderate barrier’, 4 being ‘significant barrier’). Each potential opportunity was also rated on a scale of 1 to 4 (1 being ‘not useful at all’, 2 being ‘minimally useful’, 3 being ‘moderately useful’, 4 being ‘very useful’). In addition, six statements were presented to administrators from programmes with and without CIA requirements, with two focusing on the perceived value of CIA, three related to CIA being a financial burden, and one discussing the time commitment required for conducting a CIA. Each statement was rated on a scale from 1 to 4 (1 being ‘strongly disagree’, 2 being ‘disagree’, 3 being ‘agree’, 4 being ‘strongly agree’).
The survey questions did not include a ‘don’t know,’ ‘undecided’ or ‘neutral’ response option. The use of a neutral response option in survey research has been discussed extensively, but consensus has not been reached (Morrow and Corbin 2004). If there is any possibility that the respondent may not know the answer to a question, it is often advised to include a neutral option (Albaum 1997, Liefeld 2003). However, the drawback is that respondents might choose the option because it requires less work than carefully considering the alternatives, and using a neutral option may create overly conservative responses in some situations and provide less valid data (Krosnick 1999, Shoemaker et al. 2002, DeMars and Erwin 2004, Morrow and Corbin 2004, Local Government Data Unit of Wales 2009). The best advice is probably to use a neutral option for factual questions, but not for attitudinal questions (Walonick 2011). In this CIA study, the survey questions were used to identify the perceived barriers to and opportunities for CIA implementation. The respondent administrators all had extensive knowledge of their respective programmes. Thus, it was unlikely that they could not answer questions about their programmes. In addition, the environmental planners who helped with survey pre-testing concurred with the appropriateness of excluding a neutral response option.

The survey responses were used to address three specific policy questions regarding CIA implementation within state environmental review frameworks in the US: (1) What barriers were considered by the administrators of state environmental review programmes as inhibiting their ability to assess CIs, and how did these perceived barriers differ across programmes and why? (2) What strategies could be used to promote CIA among these programmes, and how did the perceived opportunities differ across programmes and why? and (3) Why did certain programmes not require CIA and how to help these programmes be more open to the idea of integrating CIA into their environmental review process?

4. Results and discussion

4.1. Barriers to CIA within state environmental review frameworks in the US

Overall three major barriers were identified by administrators of state environmental review programmes with CIA requirements: lack of explicit procedures (average rating of 3.1); unavailable data (average rating of 3.0); and ambiguous definition of CI (average rating of 3.0) (Figure 2). Similar to barriers identified at the federal level, a major concern of state programme administrators was the inability of existing state environmental review policy to guide and facilitate effective CIA implementation. This inability was reflected by the first two major barriers indicating the perceived failure of state environmental review programmes to actually develop procedures and contribute to data collection relevant to measuring CIs. The tractability of CIA issues was also considered a major barrier, reflected by the identification of ambiguous definition of CI. However, the other aspects of policy tractability (e.g. definitions of temporal scales, geographic scales and baseline conditions for assessing CIs) were not identified by administrators to be problematic, differing from what was found within the NEPA context. Finally, the support for CIA issues was measured by three items: lack of recognition/support of the importance of CIA among state environmental review programme staff, lack of recognition/support from businesses and industries, and lack of recognition/support from the affected public. All three
items received a rating below 2.5, suggesting that the support for CIA issues was not considered to be an important barrier at the state level.

Interestingly, administrators from tier-one states rated each barrier more significantly than their counterparts from tier-two states (Figure 2). In particular, five out of 16 barriers (including the aforementioned three major barriers, lack of criteria for determining significant CIs, and lack of practical methods for evaluating CIs) received a rating of 3.0 or higher from administrators in tier-one states, while none received a rating of 3.0 or higher from administrators in tier-two states. This may be explained by the different characteristics of state-level environmental review frameworks adopted by the two tiers. Tier-one states followed the NEPA model, adopted statewide protocols, and were generally experienced in conducting environmental reviews and possibly CIAs, which may have given them greater knowledge of relevant challenges. Because of the similar nature of tier-one programmes, it is not surprising that the administrators from these programmes shared similar perspectives on CIA barriers. In contrast, tier-two states did not employ the NEPA model and instead adopted their own procedures for assessing environmental impacts on a programme-by-programme basis. Because of this lack of consistency among tier-two programmes, administrators were likely to have varied experiences, which may explain why they failed to identify common barriers across programmes. Hence, the discrepancy between administrators from the two tiers suggests that strategies for promoting CIA need to be developed to reflect the difference in tier-one and tier-two environmental review frameworks. Generally speaking, improved communication and exchange among tier-one administrators could potentially promote mutual learning to address common challenges in CIA implementation. However, the uniqueness of tier-two environmental review frameworks suggests that tier-two administrator may need to keep monitoring issues and
problems in their state and focus on developing strategies tailored to their individual programme.

### 4.2. Opportunities for CIA within state environmental review frameworks in the US

Overall, two major opportunities for improvement were identified by administrators of state environmental review programmes with CIA requirements: adopting detailed guidelines to specify what to include in a CIA (average rating of 3.0) and adopting institutional mechanisms to encourage co-ordination between the agency responsible for carrying out CIA (i.e. the permitting and/or funding agency) and other relevant state agencies (average rating of 3.0) (Figure 3). Both suggest that future effort to improve CIA practices should focus on strengthening state environmental review programmes’ ability to guide and facilitate CIA implementation. More specifically, adopting detailed procedural guidelines will support the development of an operational definition of CI, clarify the steps required to conduct an assessment and specify content to be included in the write-up. Adopting institutional mechanisms to encourage improved co-ordination can facilitate the sharing of information and technical resources, which could address the issue of data availability, one of the major barriers identified earlier. Co-ordination between the agency responsible for CIA and other relevant state agencies can make previously unavailable information and technical resources accessible, which will contribute to an improved assessment of the baseline environmental conditions and potential CIs.

Although administrators from tier-one and tier-two states shared similar views regarding the aforementioned opportunities for effective CIA, additional suggestions for improvement were made that were unique to each tier (Figure 3). Specifically, tier-one administrators believed that adopting additional state statute and administrative rules to require CIA would be a useful strategy to promote effective practices (average rating of 3.0). Environmental review programmes in tier-one states tended to be formally structured and the respondent programmes had already

![Figure 3. State environmental review programme administrator perceptions of CIA opportunities.](image-url)
integrated CIA requirements into their environmental review process. Therefore, adopting CIA requirements through state statute and administrative rules in addition to existing state environmental review policy can further increase the validity and visibility, hence, the tractability of the CIA issue, and encourage agencies to comply with relevant requirements. Administrators from tier-two states considered educating businesses and industries about the importance of CIA to be a useful strategy (average rating of 3.0). Tier-two states generally required environmental review as a prerequisite to permitting or government funding for economic development activities. As such, administrators from these states were more likely to have direct experience working with businesses and industries in their state, making them sensitive to their needs and concerns regarding the permitting process and associated environmental review requirements. Consequently, communicating with these businesses and industries was important for gaining their understanding and support for CIA implementation, and, therefore considered a major opportunity by tier-two administrators.

4.3. Concerns regarding CIA among programmes without relevant requirements

This paper also intends to gain a basic understanding of what contributes to certain programmes not requiring CIA and how to help them be more open to the idea of integrating CIA into their environmental review process. The results are summarised in Figure 4. Administrators generally acknowledged the value of CIA regardless of whether or not their programmes had CIA requirements. Those from programmes with relevant requirements indicated that CIA had enhanced their ability to identify environmental impacts and positively contributed to the decision-making process with respect to issuing permits or granting state money. Those from programmes without a formal CIA policy also recognised the potential value of CIA for increasing the utility of their programmes by disclosing likely impacts and informing permitting or funding decisions. Despite similarly positive attitudes towards the value of assessing CIs, programmes with and without CIA requirements differed in several important aspects. Administrators from programmes with relevant

Figure 4. Additional concerns about incorporating CIA into state environmental review frameworks.
requirements did not consider CIA to be a financial burden to businesses or state and local units of government. Nor did they believe that assessing CIs slowed the environmental review process in their states. However, administrators from programmes without CIA requirements were generally concerned that mandating CIA would impose a considerable financial burden and extend the time required for conducting an environmental review.

These concerns may help explain why CIA policy has not been adopted in some states. Conducting a CIA requires extensive data and technical expertise, which could lead to additional cost. Such cost would be borne by businesses or state and local government units, depending on the project proponent. Therefore, it is understandable why administrators were concerned about the potential financial burden associated with carrying out a CIA. In addition, an agency’s action is normally constrained by timelines established by state law. For example, it may be required that an environmental review document is completed and associated permitting or funding decisions are made within three months of the initial application. If data on baseline environmental conditions or other related projects are not readily available, obtaining the data necessary to assess CIs may require considerable time (Hegmann et al. 1999), potentially slowing the environmental review process and associated permitting funding processes, and resulting in the violation of the allowable timeframe.

Finally, it is worth noting that such concerns of administrators without CIA experience were not shared by administrators with CIA experience. This suggests that administrators without CIA experience may have overestimated the cost and time needed to implement CIA. Accurate estimates of the real cost and time associated with assessing CIs can help ease concerns of administrators without CIA experience and encourage the adoption of CIA requirements in states that currently do not mandate the integration of CIA as part of their state environmental review frameworks.

4.4. CIA requirements within state environmental review frameworks since 2007

The results discussed above were based on data collected in late 2007. They may not reflect any legislative changes to state environmental review regulations since the survey, or any changes in the administrative implementation of the regulations. However, a check for possible policy updates was conducted in 2011 and it is reasonable to believe that the landscape of state environmental review policies and procedures has not greatly changed. Thus, the barriers to and opportunities for effective CIA practices within state environmental review frameworks, as identified in this paper, are informative and relevant to today’s environmental planners and policy makers. Based on the aforementioned two-tier framework (Figure 1), two states were randomly selected from each tier to examine if there had been any changes in the legislative requirements and administrative guidance. The tier-one states selected were California and Hawaii and the tier-two states selected were Vermont and Michigan.

California Natural Resources Agency adopted amendments to the California Environmental Quality Act (CEQA) Guidelines for addressing analysis and mitigation of greenhouse gas emissions on 30 December 2009. Some specific requirements for assessing CIs related to greenhouse gas emissions were added (California Natural Resource Agency 2009). For example, when assessing the
significance of impacts from greenhouse gas emissions on the environment, a detailed Environmental Impact Review (EIR) must be prepared for the project if there is substantial evidence that the possible effects of a particular project are cumulatively considerable notwithstanding compliance with any adopted regulations or requirements. In addition, an adequate discussion of significant CIs for an EIR needs to include either a list of past, present and probable future projects producing related or CIs, or a summary of projections contained in an adopted local, regional or statewide plan or related planning document that describes or evaluates conditions contributing to the cumulative effect. These changes suggest that California has been moving towards adopting additional CIA regulations to address emerging environmental issues, which increases the tractability of the CIA issue in general and corresponds to the opportunity for effective CIA identified by administrators from tier-one states, as discussed earlier in this paper.

In Hawaii, a report on the state’s environmental review system was prepared by the University of Hawaii for the Hawaii State Legislature in October 2010 (Kim et al. 2010). This report identified issues and presented recommendations to improve Hawaii’s environmental review system. One of the issues identified was that the assessment of CIs was generally lacking in Hawaii, and CIA was not well understood, implemented or integrated within the state’s planning process. The report recommended strengthening the current Hawaii Environmental Policy Act to require CIA for significant actions including plans and programmes, adding a statutory definition of ‘cumulative effects’ in the Act, developing guidance on assessing priority environmental indicators for CIs, requiring the Hawaii Office of Environmental Quality to establish a database for CIA that environmental planners could utilise to assess CIs, and developing better technologies to facilitate improved CIA and information sharing among agencies, project proponents and the public. These Hawaii-specific, CIA-related issues and recommendations are consistent with the nationwide survey results discussed earlier in this paper.

In the two states selected from tier-two, little policy change was observed. Vermont’s Act 250 is a comprehensive law that evaluates the impact of a development project under a number of environmental criteria and requires environmental review as part of the state’s permitting process. A new set of Act 250 Rules was adopted in July 2009. Comparing to the rules and regulations in 2007, no change has been made regarding the assessment of CIs. Similarly, Michigan has four distinct environmental review programmes covering hazardous waste management, coal mining, wetland and water management, and sand dune mining projects. The extent to which CIA is required has not changed in any of these four programmes since 2007.

5. Conclusion

CIA has been required as part of many countries’ EIA process and is supported by a range of guidance internationally (Therivel and Ross 2007). In the late 1990s, the annual meetings for the International Association for Impact Assessment began to include papers and topical sessions on CIA (Canter and Ross 2008). Starting from early 2000s, many countries have made considerable effort to assess the current state of CIA and examine strategies for improving CIA within EIA frameworks, particularly in Canada and the UK (e.g. Baxter et al. 2001, Piper 2001, 2002, Cooper and Sheate 2002, Dubé 2003, Duinker and Greig 2006, Bérubé 2007,
Harriman and Noble 2008, Creasey and Ross 2009, Gunn and Noble 2009, Masden et al. 2010). Some scholars have also argued that strategic environmental assessment, which allows for better consideration of larger areas and longer time periods, and hence a wider range of CIs beyond individual projects, may be a better approach for assessing CIs (Antoniuk 2000, Bonnell and Storey 2000, Creasey 2002, Cooper and Sheate 2004, Therivel and Ross 2007, Noble 2008, Harriman and Noble 2009). In contrast to the growing attention on CIA in many countries, relatively little has been done in recent years to inform the development and implementation of CIA policy in the US. A large number of peer-reviewed publications regarding CIA practices appeared in the 1990s, but few have been published on CIA related topics since 2000 (e.g. MacDonald 2000, Smythe and Isber 2003, Smith 2006, Ma et al. 2009b, Senner 2011). Moreover, past studies have focused primarily on federal requirements and practices within the context of NEPA, with minimal attention given to the challenges and opportunities related to carrying out CIA within state-level environmental review frameworks.

This paper provided a much-needed assessment of important barriers to and opportunities for state-level CIA in the US. Similarly to what has been suggested within the context of NEPA, the inability of state environmental review programmes to facilitate CIA practices was considered an inhibitor to effective implementation by administrators of these programmes, particularly reflected by the perceived lack of explicit procedures and data for conducting a CIA. Adopting detailed guidelines specifying what to include in an assessment and adopting institutional mechanisms to encourage state agency co-ordination were both identified as important strategies for CIA improvement. These major barriers and opportunities were generally shared across programmes, but some differences in programme administrator perception were observed, due to the different environmental review frameworks within which CIs are assessed. This paper also suggested that administrators without CIA experience seemed to have overestimated the cost and time needed to implement CIA. Helping them better understand the real cost and time required for assessing CIs may contribute to the adoption of CIA procedures in these states.

Given the importance of CIA, government agencies, private businesses, non-profit organisations and other stakeholder groups need individuals who have been trained in decision making, analysis and documentation aspects of both project-specific EIA and broader CIA. A number of certificate programmes (e.g. NEPA certificate programmes at Utah State University and Duke University) have been established in the US to prepare natural resource and environmental professionals to meet the challenges of complying with NEPA and working effectively on NEPA documents. What is lacking is an effort to prepare individuals involved in state-level environmental review to have a good understanding of CIA requirements in various state regulations and be more effective members of interdisciplinary teams responsible for assessing CIs as part of a state-level EIA process or broader strategic planning activities.

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Part of Section 2 (Assessing cumulative impacts in the US) and Figure 1 have been previously published (2009) in the full-length article, titled “Characterising the landscape of state environmental review policies and procedures in the United States: a national assessment,” in the Journal of Environmental Planning and Management, 52(8), 1035–1051.
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